

Hello Hoa Pham,

I am still confused about your office action and how I need to respond. Based on our last phone conversation, my understanding is that I can submit a response with the extension of time under 37 CFR 1.136(a). If I submit that by tomorrow, under small entity status, I believe I would need to include \$55.00. Please confirm.

In response to your DETAILED ACTION:

- 1) I agree figures 1, 2a, 2b and 2c should be designated as --Prior Art--
- 2) My understanding of the appropriate paragraphs of 35 U.S.C 102 is that I am not allow claims if someone else claimed them first. I respectfully disagree that anyone has made the same or similar claims.
- 3) I respectfully disagree that Migdal et al fully anticipates my invention. The concept of triangulating for ranging purposes goes back hundreds, perhaps thousands, of years. The inventive part is the way in which triangulation is applied for efficiency, accuracy, speed, resolution, etc. The invention by Migdal, when compared to mine, fails in the following ways:
  - A) It is slow. In order to capture an image, Migdal's device mechanically scans the scene of interest. My method is orders of magnitude faster. Migdal must take several images to completely resolve a scene and the interval between each image takes on the order of one thirtieth of a second (30 frames per second). Thus Migdal's system requires many intervals of 33 milliseconds (1/30 second). In fact, my invention has the ability to capture surface topographies in a femtosecond (1/1,000,000,000,000,000). That's about fourteen orders of magnitude faster. This is important for a variety of applications, including monitoring the evolution of shocked surfaces (as in the case of analyzing the jets formed by explosive shaped charges).
  - B) It is complex, costly and less reliable. My invention has no moving parts which makes it inherently cheaper, simpler and more reliable.
  - C) It has lower resolution. Migdal claims to capture 10 lines per image while my system is only limited by the number of lines in the detector. A typical one megapixel digital camera has a 1000 lines or more. Thus my

system captures over 1000 lines per image which is two orders of magnitude greater than Migdal.

D) It makes incorrect assumptions about being able to divide the frames. Migdal's method suffers when extreme topographies cause one of his projected lines to cross another one. His system relies on them remaining separated. In my system, every line is unique (has a uniquely recognizable color) and there will never be an ambiguity as to which line is which.

4) The prior art mentioned is also inferior to my invention and I will briefly address important (but by no means all of the) deficiencies.

A) Liskow et al and Greivenkamp, Jr. et al use Moire interferometry to obtain a topographical map of a surface. While this is fine for smooth and gentle topographies, it fails when shapes get extreme. For example, a face with nostrils, will result in lines that cannot be precisely referenced to other lines in the image. Thus, the topographical height of groups of lines is unknown and even their slope (sloping toward or away) can be impossible to determine. My system, however, can triangulate on every point in the image independent of how extreme the topography is. My technique is an absolute method while the other methods require the relative knowledge of adjacent points (such as the path of a line along the surface).

B) Smith uses an array of identical lines (a grating) which works fine for smooth surfaces but fails as described above when there are discontinuities (like nostril holes). Smith also requires a minimum of two CCDs (see Smith's figure 9) while mine works with just one, making my system different, cheaper and simpler (since a 2 CCD system has inherent alignment challenges). Smith also requires polarized light which adds expense and complication to his system while my method works independently of polarization.

C) Hecker et al requires a moving scanner while mine has no moving parts. My invention is thus significantly cheaper, faster, simpler, more robust and more reliable.

I look forward to hearing from you soon.

Best Regards,  
Derek Decker



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